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Night, weather, and runway environment illusions are ever-present risks. How many accidents are due to...

SPATIAL DISORIENTATION

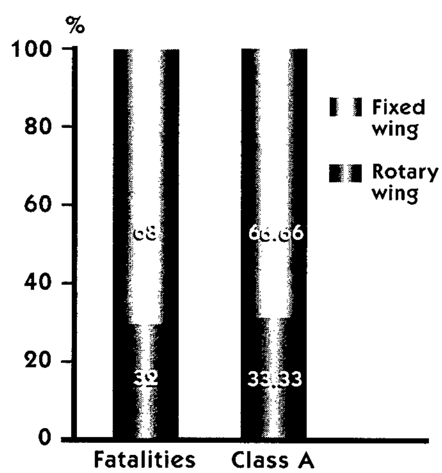
IFR Accidents—Where's the Risk?

This article is drawn from information from the Safety Center database, and from a study conducted for the Flight Safety Foundation of approach and landing accidents worldwide. Summary statistics, conclusions of the study, and approach tips and techniques are presented to highlight the risk involved and possible ways of assessing and dealing with that risk.

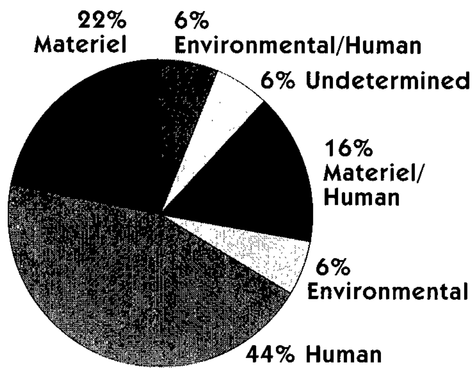
USASC Data

A review of US Army Safety Center accident data of IFR accidents since FY80 provided the basis for the following results. The review encompassed all Class A accidents involving Army aircraft on instrument-flight plans. The data did not include any data associated with inadvertent IMC mishaps. Since FY80 there have been 18 Class A IFR accidents. Of these accidents, 33% were rotary-wing and 67% were fixed-wing. There were 25 fatalities with approximately the same ratio of rotary-wing/fixed-wing fatalities- 32% and 68% respectively.

IFR Accidents FY80 to Present



Accident Causal Factors



Of the solely human-factor accidents, 62.5% occurred during the approach or missed-approach phase of flight, and 37.5% were at cruise altitude. One accident involved a mid-air collision and accounted for 12% of total fatalities for the period.

Highest Risk Areas

The approach and missed-approach phases of flight accounted for 71% of all fatal accidents. Of those, 80% were at night. From the data, it is apparent the two most critical phases of flight are the approach and the missed-approach. Additionally, night IMC operations increase risk disproportionately, even for an experienced aviator. The average total time for the PC of the fatal approach accident aircraft was 5,763 hours.

Flight Safety Foundation Data

The Flight Safety Foundation (FSF) is an international organization dedicated to the continuous improvement of flight safety. They chartered an Approach and Landing Accident (ALA) Reduction Task Force to study 287 fatal accidents occurring worldwide from 1980 to 1996. These resulted in 7,185 fatalities. Of note is that of the 118 accidents where the type of approach was known, over 75% were on approaches where a precision approach aid was not available or not used.

The study provided eight conclusions for preventing approach and landing accidents. Although the study involved large jet and turbo-prop aircraft world-wide, the results and recommendations have relevance for Army aviation as well. Three of the eight conclusions are especially pertinent to operational pilots.

Coping Strategies

CONCLUSION #1: The risk of ALAs is higher in operations conducted in low light and poor visibility, on wet or otherwise contaminated runways, increasing susceptibility to optical or physiological illusions. The study recommends that crews use a risk-assessment checklist to identify approach and landing hazards and are trained adequately before conducting operations. The study suggests that the accident rate at night is nearly three times greater than for day, which is similar to Army experience.

The Army has no specific risk-assessment checklist for approach and landing operations. The following thoughts may prove useful for your personal assessment for the approach and landing. By assigning a numerical factor or risk level to each area and condition, a simple, but practical, assessment checklist materializes. Add categories based

on your experiences and personal limits.

ILLUSIONS

Night, weather and runway environment illusions are an ever-present risk. However, the risk is significantly increased when executing an approach at night in weather close to or at minimums for the approach being flown. Anticipating the illusions, using glide slope and VASI systems, and maintaining instrument proficiency provide the best defense against spatial disorientation. Spatial disorientation (SD) is an individual's inaccurate perception of position, attitude, and motion relative to the center of the earth. *(See article on pages 6 and 7.)*

SUGGESTED ASSESSMENT AREAS

During planning and update enroute:
- **Day or night**
- **Wx Conditions, LIFR, IFR, MVFR, VFR**
- **Aircraft equipment: VOR, ADF, GPS, ILS**
- **Familiarity with approach**

Prior to arrival (descent):
- **Approach briefing, thorough and complete**

During approach:
- **Approach stabilized: heading, altitude, airspeed, and descent rate (see Suggested Stabilized Approach Checklist for defining a stabilized approach)**
- **Missed approach committed to memory**
- **Intentions in case of a missed approach; another attempt, alternate, etc.**

Sample Planning Matrix

Condition	VFR	MVFR	IFR	LIFR
Day	L	L	M	H
Night	L	M	H	EH
Highest Risk Value				

VFR= >3000' CIG, > 5 sm VIS; MVFR= 1-3000' CIG, 3-5 sm VIS; IFR= 500-<1000' CIG, 1<3 sm VIS; LIFR= <500' CIG, <1 sm VIS.

Equipment	VFR	MVFR	IFR	LIFR
Non-Precision	L	M	H	EH
Precision	L	L	M	H
Highest Risk Value				

Approach Familiarity	Routine Use	Seldom	Never
Non-Precision	L	M	H
Highest Risk Value			

Airborne Checklist

APPROACH ASSESSMENT CHECKLIST	YES	NO
Planning remains the same:		
Day/Night		
Nav equipment		
Approach brief complete prior to arrival		
Missed approach memorized		
Missed approach intentions planned		
Approach stabilized		

Any "no" checks mean the approach may be rushed and risk is increasing. Time should be allowed to assess the "no" status and its impact to the successful outcome of your flight.

VESTIBULAR ILLUSIONS

The vestibular system, associated with the ear, poses the greatest problem in spatial orientation. One of the more dangerous vestibular illusions is the oculogravic illusion from linear acceleration. Suppose you're flying an approach in poor weather and a missed approach is initiated. The acceleration from applying power during the maneuver forces the hair cells in your otolith organs aft. This creates a false sense of the aircraft nosing up. If the pilot reacts to this sensation without cross checking his/her instruments they will most likely dive the aircraft. If you are on an ILS and at 200 feet AGL, there is very little room for error.

The most dangerous vestibular illusion is the coriolis illusion. The coriolis illusion can take place anytime a climbing or descending turn is initiated, such as executing the missed approach. Fluid in one semicircular canal in each ear is stimulated when initiating a turn. If the pilot then makes a head motion in another geometrical plane, the fluid in the two other semicircular canals in each ear is stimulated. This results in the pilot sensing roll, pitch and yaw simultaneously and causes overwhelming disorientation.

Other illusions of concern are visual, and may include:

- Confusion with ground lights, or stars
- Runway width, Runway/terrain slope,
- Featureless terrain, and Structural illusions.
- Lights along roads, on moving cars or trains, may be mistaken for approach or runway lights.
- Runways wider than normal create the illusion the aircraft is lower than it actually is.
- Conversely, narrower runways lead to flying lower approaches and increase the risk of landing short, or impacting obstacles in the approach path.
- Up-sloping runways or terrain create the illusion that the aircraft is higher than it actually is,

and leads to lower approaches as well.

■ Down-sloping terrain has the opposite effect.

■ Featureless terrain, such as dark areas and snow-covered terrain, or executing an approach at night, in the rain, with few visual cues, will create the illusion of the aircraft altitude being higher than it actually is. These increase the risk of making a lower-than-normal approach.

■ Structural illusions caused by rain or other obscurations on the approach and landing may lead to increased susceptibility to other illusions, such as perceiving greater distance to the runway than actual, or misjudging airport features.

CONCLUSION #2: Unstabilized and rushed approaches contribute to ALAs. Recommendations from the study included defining parameters of a stabilized approach and executing the missed approach if parameters are exceeded. Further, flight crews should "take time to make time" when the cockpit situation becomes confusing or ambiguous. This means climbing, holding, requesting vectors for delaying purposes, or executing missed-approach early.

Except for fixed-wing operations, the Army does not stipulate or recommend an approach checklist or briefing to follow for instrument flights. The approach checklist in fixed-wing operator manuals does not define parameters of a stabilized approach. Below are some suggestions for defining a stabilized approach for the readers' use and contemplation. This checklist is not intended to replace current ATM standards or regulation, but does provide general guidance for safe, professional approaches. In addition, the design of some approaches may require adjustments to the checklist (for example, descent rate) based on mission planning.

In one Army airframe of the modernized fleet, the Kiowa Warrior, you're in an emergency situation if you go IMC. The fact that a Kiowa Warrior pilot is not supposed to go IMC does not mean someone won't find himself or herself in that situation. One thing for sure, if "Murphy" is out there, pilots will find themselves in an emergency situation. It will serve them well if they have maintained their instrument skills and knowledge of radar capabilities available from ATC.

Rushed approaches are easier to prevent than unstabilized approaches. If ATC asks you to accept vectors putting you in too close for the turn to final, necessitating steep turns, then don't accept—request longer legs or vectors. If you rush yourself, recognize it, and then fix it. Request holding, vectors, going missed early, etc. You are in charge of the aircraft, so take charge. Five or seven more minutes in the air to execute a well-flown, stabilized approach will increase the safety of the flight. It should also avert having to execute a missed approach because of poor course alignment, confusion, or not reaching MDA in sufficient time to see the runway environment, and so on. It will save you time in the final analysis.

SUGGESTED APPROACH TIPS

Before reaching the IAF-

Review weather (ATIS, AWOS, current altimeter)
- Identify and verify correct approach plate
- Set up avionics
- Brief the approach (direction, time, MDA/DH)
- Review missed-approach instructions

Review 5 T's after all turns and crossing IAF
- Turn (new course)
- Tune (select course)
- Time (if necessary)
- Torque (as required)
- Talk (to ATC as required)

Crossing FAF/OM-
- Review 5 T's
- Establish stabilized descent
- Verify altitude when crossing OM on ILS
- Make altitude call outs above MDA/DH - 500 ft above, 400, etc.
- Maintain awareness of position on approach (use all avionics available)
- Execute an immediate missed approach if confused, uncertain, or the approach becomes unstabilized

SUGGESTED STABILIZED APPROACH CHECKLIST

- By 1000' HAA, HAT, or HAL:
- Intended flight path; only minor changes in heading/pitch required, no more than two dot deflection of glide slope/localizer
- Speed; no more than +10/-5 of recommended approach speed
- Power settings; The aircraft is in approach configuration
- Descent rate; no more than 1000 fpm
- All briefings and checklists performed

CONCLUSION #3: Failure to recognize the need for and execution of a missed approach, when appropriate, is a major cause of ALAs. The FSF recommends that company policies specify visibility minima to proceed past the final approach fix (FAF) or the outer marker (OM), and an assessment at the FAF or OM of crew and aircraft readiness for the approach.

AR 95-1 states an approach may be initiated, regardless of ceiling and visibility. An assessment of crew and aircraft readiness for the approach, however, is not specified. Your judgment reigns here. How much fuel is available to proceed to your alternate and meet reserve requirements? What is the status of your navigation equipment? Did you short-change yourself by not filing an alternate? What is your personal minimums-time since last flown in low IFR? What is the state of readiness for your pilot? Is he undergoing refresher training? Does he have high- or low-weather time? And so on. Serious thought before takeoff should go into your planning and risk management for the flight. *(See the sample planning matrix/airborne checklist)*

Perhaps as hazardous as any aspect of instrument flight is the missed approach. AR 95-1 is very clear on when a missed approach is required. You may not descend below the MDA or DH unless the approach threshold of the runway, or approach lights or other markings identifiable with the approach end of the runway or landing area, are clearly visible, **AND** the aircraft is in a position to make a safe approach. Delay in initiating the missed-approach procedure, when it is required, elevates the associated risk exponentially.

Conclusion

Risk assessment and risk management are continuing processes that go far beyond filling in a risk assessment worksheet and filing it away in operations. Risk management is an iterative process, which changes with every decision made, from pre-flight planning through mission debrief. Recognition of hazards, taking action to mitigate and control the risk associated with the hazards, and adjusting the mission as necessary for successful completion, is at the heart of safe operations. This is true risk management.

IFR accidents are a real threat to Army aviation. Our data shows that the landing and missed-approach phases of flight produced 71% of fatal IFR accidents from FY80 to the present. The distribution of IFR accidents is roughly 1/3 rotary-wing and 2/3 fixed-wing aircraft. The Flight Safety Foundation ALA Task Force's goal is to reduce the number of ALAs by 50% over 5 years. Their study provides eight conclusions and recommendations that are low-cost and universally applicable to achieving this goal.

The three conclusions presented in this article apply particularly to operational pilots as well as to Army aviation as a whole. The tips, techniques, assessments, and ideas are food for thought for your use. Tailor them to your specific situation for the improvement of safety and accident prevention.

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SUGGESTED MISSED-APPROACH TIPS

- Always plan to fly the missed.
- Select several alternates.
- Get weather updates during the flight to weigh your options.
- Don't fly more than two approaches if weather is at minimums.
- Don't fly more than one approach if weather is below minimums.
- Commit yourself to not going below minimums.
- Recompute fuel and time to alternate.

Final Exam on IFR

1. You are en route on an IFR flight plan when ATC advises, "Radar service terminated." What action is appropriate at this point?
   - a. Set transponder to 1200
   - b. Resume normal position reporting
   - c. Activate the IDENT feature to reestablish radar contact
   - d. Set transponder to STANDBY or OFF

2. Which of the following reports should not be made to ATC without a specific request when in radar contact?
   - a. When leaving any assigned holding fix or point
   - b. When leaving the final approach fix inbound on final approach
   - c. The time and altitude or flight level upon reaching a holding fix or point to which cleared
   - d. When an altitude change will be made when on a VFR-on-top clearance

3. Which factor was the largest cause of accidents since FY80?
   - a. Materiel
   - b. Environmental
   - c. Human
   - d. Undetermined

4. At what point should the timing begin for the first leg outbound in a holding pattern at the intersection to two VOR radials?
   - a. Abeam the holding fix or wings level, whichever occurs last
   - b. Abeam the holding fix or wings level, whichever occurs first
   - c. When the wings are level at the completion of the 180-degree turn outbound
   - d. When abeam the holding fix

5. Why is Frost considered hazardous to flight operation?
   - a. The increased weight requires a greater takeoff distance
   - b. Frost changes the basic aerodynamic shape of the airfoil
   - c. Frost decreases control effectiveness
   - d. Frost causes early airflow separation resulting in a loss of lift

6. What is the most dangerous spatial disorientation illusion?
   - a. Leans
   - b. Graveyard spiral
   - c. Coriolis
   - d. Elevator

7. AR 95-1 states an approach may be initiated regardless of—
   - a. Ceiling
   - b. Visibility
   - c. Both a. and b.
   - d. None of the above

8. Select the answer that best describes when to use the Risk-Management process.
   - a. Before the flight
   - b. Continuously
   - c. After takeoff
   - d. It is no longer needed

9. How many IFR accidents are rotary wing (roughly)?
   - a. Two-thirds
   - b. One-half
   - c. One-third
   - d. One-quarter

10. The Safety Foundation Approach and Landing Accident's Task Force's goal is to reduce the number of approach and landing accidents by 50% over how many years?
    - a. Three
    - b. Four
    - c. Five
    - d. Six

Answers:
1. b, 2. b, 3. c, 4. d, 5. b, 6. c, 7. c, 8. b, 9. c, 10. c

Aeromedical Training Combats Spatial Disorientation

The pre-mission planning, crew briefing, and aircraft pre-flight procedures were completed. The crew was going to conduct night instrument training in their local flight-training area. The crew had met the requirements outlined in Chapter 5, AR 95-1, before departure on the instrument training flight. It was shortly after 1830 hours when the crew had run up the aircraft, taxied into position and was awaiting clearance for departure. The training proceeded as planned until their last missed approach. The aircraft was a quarter of a mile past the departure end of the runway when it impacted the ground. At 2030 hours the aircraft was lying on its side in a densely wooded area. The co-pilot (CP) was dead. The pilot-in-command (PC) escaped with serious, but survivable, injuries. Questions were running through the pilot-in-command's mind: What went wrong and why?

After several successful instrument (IMC) take-offs and landings, the crew was ready for one more approach before calling it a night. Even though the weather had deteriorated, the crew was executing a missed approach for a return, straight-in approach. As the aircraft accelerated, it entered instrument meteorological conditions. The PC perceived that the aircraft had entered an excessive nose-up attitude. Instinctively, the PC nosed the aircraft over. This action put the aircraft into a dive. The attention of the CP was diverted, and he did not detect the descent. Before the PC could correct the mistake, the aircraft had stuck the trees off the departure end of the runway. The

crash ended violently.

Although this accident is fictional, accidents or near misses like these have occurred in the not so distant past. Why do they happen? In this hypothetical case, spatial disorientation (SD) was the significant contributing factor. What is Spatial Disorientation? SD is an individual's inaccurate perception of position, attitude, and motion relative to the center of the earth (FM 1-301, 1987, p. 8-1). This is a classic case of unrecognized spatial disorientation. The pilot does not consciously perceive any of the manifestations of disorientation, i.e., pilot(s) are unaware that they have an inaccurate perception of their position, attitude, or motion.

Research and Statistics

The type of accident mentioned above led to research conducted jointly by the U.S. Army Aeromedical Research Laboratory (USAARL) and the U.S. Army Safety Center (USASC) into SD. A retrospective analysis examined Class A-C Army helicopter accidents during an eight-year period from 1 May 1987 through 30 April 1995. The analysis presented a number of disturbing facts: 1) 30 percent of the Class A-C accidents considered SD a significant factor; 2) One hundred and ten lives were lost in these accidents; 3) Costs were estimated at 468 million dollars; and 4) 43 percent of the accidents occurred during flight using Night Vision Devices (NVD). USAARL surveyed 299 Army pilots about their experience with SD. The results included the following: 1) 78 percent of the pilots had experienced SD during their flying career, 2) 22 percent had experienced SD in the previous four months, 3) 33 percent reported that the mission was adversely affected, 4) 2 percent reported that the mission had ended in mishap, 5) 44 percent had experienced the leans, and 6) 13 percent had experienced brownout, whiteout, or inadvertent entry into instrument meteorological conditions (IMC). The information gathered in the case studies contributed to a growing concern that SD played a far greater role in aircraft accidents and incidents than previously thought.

Control Measures

SD control measures can be separated into four major categories: education, training, research and equipment. Although control measures in research and equipment have continued, the most significant step forward initiated by the Army is in the categories of education and training. Specifically, it was the development of an SD demonstration sortie to augment ground-based training.

Instruction and Training

After the completion of the SD sortie demonstration evaluation in June 1997, it was included as part of the Program of Instruction for the IERW (initial entry rotary wing) flight students. Training is conducted by the US Army School of Aviation Medicine instructors, and is flown by IPs/PCs from 1/212th Aviation Regiment, Aviation Training Brigade (ATB), U.S. Army Aviation Center and School. Since its adoption, more than 700 IERW flight students have received this training. Four hours of didactic SD instruction is provided to all IERW students. Also, one hour of in-depth SD refresher instruction is provided to all rotary-wing advanced aircraft qualification courses, instructor pilot courses, and fixed-wing qualification course. These courses provide the cornerstone for the prevention of accidents involving spatial disorientation. The advantages of SD training are emphasized by a comment made by a Standardization Instructor Pilot (SIP). "The demonstration was extremely beneficial because it so clearly demonstrated the physical limitations of our orientation system. As an instructor, I am enthusiastic about the potential benefits to aviator training. We can attribute many accidents to failures to maintain aircraft position."

In addition, USAARL has developed SD Awareness Training Scenarios for visual flight rules in the AH-64, CH-47 and UH-60 simulators. The scenarios were developed from research gathered from real-world accidents. They allow IPs to train other aviators on how to overcome SD, once encountered. Future spatial disorientation demonstration flights will be conducted by IPs during the primary flight or instrument training portion of the IERW course.

Conclusion

Spatial Disorientation plays an undeniable role in accidents, and is a significant factor in Army aviation operations. It is clearly a hazard requiring risk assessment and continuing emphasis must be placed on identifying appropriate control measures in the areas of education, training, research, and equipment. However, the vital link in preventing SD related accidents is the continuation of realistic SD training in Army aviation operations, in the classroom, in flight training, and at the unit.

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The U.S. Army Flight Surgeon

An Integral Part of the Commander's Aviation Accident Prevention Plan

Is your flight surgeon doing everything he/she is supposed to do? How often do you see the flight surgeon—annually to get your flight physical, or only when you go to the clinic to get an up-slip? Some flight surgeons participate in unit activities, but many don't.

What is the most important duty of the flight surgeon? Completing the flight physicals? Participating in the Commander's Accident Prevention Plan (CAPP)? Performing as a crewmember? Investigating accidents? I say it is participation in the CAPP.

The flight surgeon is an important person in the aviation CAPP. All of the flight surgeon's duties are a part of preventing aviation accidents. Completing flying duty medical exams (FDMEs) ensures that all crewmembers meet the medical qualifications for aviation duties. Flight surgeon participation in the safety and standardization council meetings ensures the councils have expert advice in reaching decisions and eliminating or reducing hazards. When flight surgeons participate in aerial flight they evaluate crewmembers to detect personality traits or crew interaction that could be hazardous. The flight surgeon is an expert in aeromedical and physiological aspects of flight, and should be used to teach classes on these subjects as part of the Aircrew Training Program (TC 1-210) or during unit safety meetings. Everything flight surgeons do, even the flight physical, is part of the CAPP, but not every flight surgeon is active in unit activities outside the clinic.

In the Army Aviation community, there is a wide range of uses of the flight surgeon's knowledge and expertise. In many cases flight surgeons don't have time to participate in the non-clinical functions that their position requires. They are bogged down in the clinic completing physicals, writing aeromedical summaries to obtain medical waivers, or working in a clinic in the Medical Treatment Facility (MTF) seeing non-aviation patients. All of this work is important, but flight surgeon duties are more than clinical—there are unit requirements necessary to support an aviation commander.

Different Bosses' Needs

Flight surgeons work for different bosses, no matter where they are assigned. It is difficult to please everyone, and flight surgeons know this better than anyone. When a doctor is assigned to an aviation unit, he/she works for the unit commander. However, it's the MTF commander who credentials the doctor (allows them to practice medicine) and provides the resources (workspace, civilian clerks, equipment, medication, etc) to run a garrison clinic. If the flight surgeon is assigned to a MTF, the doctor works for the MTF commander but is needed to provide support to the aviation unit commander. Both commanders compete for the flight surgeon's time and knowledge. Often, the flight surgeon is stuck in the middle of this struggle, trying to please two bosses. It is imperative that the aviation unit commander and the MTF commander talk to each other to understand each other's wants and needs and to set the work schedule for the flight surgeon. It isn't good leadership to put the flight surgeon in the middle.

The flight surgeon's non-clinical duties are listed in various Army Regulations. Army Regulation 40-501, *Standards of Medical Fitness*, provides the guidelines for completing physicals and for advising the commander on health of the command. However, AR 385-95, *Army Aviation Accident Prevention*, provides the guidelines for participation in the unit's CAPP. Chapter 1, paragraph 1-6g lists fourteen duties that the flight surgeon performs outside the clinic. These two regulations don't cover everything a flight surgeon should do, but illustrate the flight surgeon's duties and responsibilities.

Another good source for discovering the flight surgeon's duties and responsibilities is the *Forces Command (FORSCOM) Aviation Resource Management Survey (ARMS) Commander's Guide*. The guide is a checklist for completing ARMS inspections, and also lists the references that cite the requirements. The checklist is located at: http://www.forscom.army.mil/avn

Flight surgeons aren't just doctors, they are members of the unit. And they are an important part of the Commander's Accident Prevention Plan. Are you getting all you need out of your flight surgeon? Do you know what the flight surgeon's duties are? Educate yourself along with your flight surgeon and improve the CAPP. The next life you save could be your own.

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Army Values and Aviation Safety—They Go Together

In 1997, GEN Dennis J. Reimer, Chief of Staff of the Army, codified a revised list of Army Core Values. This specific list is now quite familiar to soldiers worldwide. Yet, the application and importance of these values in the daily conduct of operations still have to achieve full recognition. This article addresses how some of those values play a vital role in Aviation safety, and illustrates how broadly the Army Values apply and how vital their application is to the Army's meeting its basic missions.

Loyalty, Duty, Respect, Selfless service, Honor, Integrity and Personal Courage don't necessarily seem like things that would directly affect Aviation safety. Tragic accidents show that they do. These values particularly affect aviation safety through their impact on crew coordination and situational awareness.

Where Values Were Lacking

One example of where lack of Respect, Loyalty, Honor, Duty, Selfless Service, and Integrity contributed to disaster came in the crash of a helicopter during a night flight to practice terrain navigation. Two aircraft were involved. The pilot-in-command (PC) of the lead aircraft had a reputation for treating his subordinates harshly. The unit's standing operating procedures (SOP) required the crew of the wing ship in a two-ship flight to monitor the lead's navigation, and call a code word over the mission frequency if they detected any deviation from the planned route. On a prior mission, the crew of the wing ship had done this. When that mission was over, the PC reprimanded them for breaking radio silence. On this mission, when the wing ship saw the PC deviate—even having to reverse course twice—the crew discussed calling the code word. The PC of the wing ship reminded them that the lead PC had just chewed them out over radio discipline. They agreed to let him fly a few more minutes before calling the code word. Less than a minute later, the lead ship hit wires and crashed. The lead PC's lack of respect for his fellow soldiers bred dissension. The lack of loyalty and integrity on the part of the other crew, and their failure to do their duty as prescribed by the unit SOP, let the lead aircraft get into a disastrous situation.

No One Took Action

Lack of Duty, Honor, and Integrity were clearly present in a fatal accident involving an OH-58A on a cross-country training flight. The PC was seen flying the aircraft at 90-100 knots and about five feet above a lake surface. A materiel problem had imposed a restriction of 400′ AGL as a minimum altitude for this series of aircraft. The pilot outranked the PC and was the acting unit commander. The pilot told the PC

he was flying too low but let the PC divert his attention to the map. Seconds later the aircraft crashed. The accident investigation showed that the PC had been the subject of six operational hazards reports in the previous years, all for high-risk flying. The PC had a reputation in the unit as someone who would often deviate from standard practices. He became defensive anytime anyone approached him about his flying. Despite this observed behavior and common assessment of his behavior, no one took action to prevent him from flying. Failing to do their duty by insisting on adherence to standards and failing to do what everyone knew was the right thing cost someone his life, as well as losing an aircraft.

Fatal Results

Simple neglect of Duty can easily have fatal results. During a night vision goggle (NVG) air assault raid, one rappeller was killed because an experienced pilot failed to recognize the inexperience of the crew chief (CE) and the air mission commander (AMC). During the pre-mission briefing, the AMC did not follow the unit SOP by requiring two people on Chalk 2 to clear ropes. The PC of Chalk 2, who had co-written the SOP, did not call the AMC's attention to his oversight. Nor did the PC adequately review the detailed procedures with the CE for ensuring that rappellers were clear before departure. As a result, the CE became overwhelmed by his tasks during the insertion. In a rush to see if the rappellers were clear, he looked under the belly from the left side to clear the right-side ropes. He failed to see that the last rappeller was still on one of the right-side ropes. The CE gave the "clear" signal to the PC, who began to depart the landing zone. The rappeller eventually lost his grip and fell 130' to his death.

Positive Effects of Army Values

Examples of successful recoveries from dangerous situations show the positive effects of expressing the Army Values. An example where Loyalty, Duty, and Personal Courage prevented a disaster occurred when an AH-1F on a daylight, cross-country training mission entered inadvertent instrument meteorological conditions (IMC). The PC, flying from the back seat, continued looking outside the cockpit in an apparent effort to regain VFR conditions. The enlisted crewman in the front seat immediately focused on his instruments. The attitude indicator showed the aircraft in a nose-down, left-bank attitude. The AH-1F was descending at 2500 feet per minute, and the PC seemed to be fixated. At 500' AGL the crewman told the PC they were in a dive. The PC jerked back the cyclic but was unable to control the aircraft with use of the instruments and began to panic. The enlisted crewmember began speaking calmly to the PC, talked him through the procedures to regain control, and pointed out the deviations in attitude, altitude, and airspeed until they were able to land. By his Loyalty, Duty, and Personal Courage, the enlisted crewman probably saved both their lives and their aircraft.

Team Effort

An example where Loyalty, Duty, and Respect probably prevented an accident occurred when one of two AH-1Fs on a night-flying mission experienced a hydraulic system failure. Because of threatening weather conditions, both pilots decided to return to base and conduct a closed traffic-pattern landing. The lead aircraft gained spacing from the second, made a normal approach to the middle of the runway, and was beginning a takeoff as the second aircraft approached. On climb-out, the lead pilots heard a loud pop and saw the master caution and No. 1 hydraulic pressure segment warning lights go on. The PI transferred the controls to the PC, who leveled the aircraft and notified the tower. The second aircraft cleared while the incident aircraft PC and PI began executing Dash-10 checklist procedures for a hydraulic failure below 40 knots. The PC tried to circle, but the pedals became unmanageable. The PC then decided to extend the downwind leg and try a run-on landing above 50 knots. Visibility was poor; and, when the PC asked the tower to turn up the intensity of the runway lights, the tower could not comply. On final, the PC executed a run-on landing as the PI continuously updated altitude, airspeed, and rate of descent. The team effort allowed the PC and PI to make a safe run-on landing. Their mutual Loyalty, performance of Duty, and Respect for each other made that team effort possible.

These are only a few examples from among many incidents in the annals of Aviation safety that show how soldiers do or don't express the basic Army Values; clearly Values can make the difference between success and disaster. So, the next time you head for the flight line, remember: Don't leave your Values behind. Lives depend on them.

—Brian Michaud, Graduate Division, Aviation Training Brigade, and Dr. Jim Williams, Aviation Branch Historian, Fort Rucker, AL, DSN 558-5306 (334-255-5306) williamsj@rucker.army.mil

Shortfax
Keeping you up to date

Don't Mix up Fuel Cans

Mistaking a five-gallon fuel can for a five-gallon water can will lead to serious problems, including burns and fires. Use the following information to help tell the difference between the two cans.

Fuel and water cans have the same footprint and dimensions. Both cans are labeled with an "X" on each side. The "X" has a circle in the middle that surrounds the identity of the liquid in the can: "WATER" for the water can and "FUEL" for the fuel can. Fuel and water cans can be the same color so it is not always useful to identify the liquid in the container by its color.

Fuel cans can be distinguished from water cans in several ways. First, the cap assemblies are different. The water can cap has two smaller caps within it. The fuel can cap is smooth on the top (minus the retaining strap). Second, the number of handles per can is different. Fuel cans have three handles per can while water cans have just a single handle. Third, the marking on the two cans is not the same. "WATER" protrudes from the water can, while "FUEL" is embossed inwardly. Fourth, the odor of fuel is present in used fuel cans. Be aware of that smell when distinguishing the two cans.

Your senses can be used to tell the difference between the two cans. Remember to use your senses if you are not sure which can you are using.

- **Sight:** Note the number of handles and the "FUEL" or "WATER" label
- **Touch:** Number of handles, difference in caps and the embossing
- **Smell:** Fuel odor versus water odor
- **Hearing:** A fuel can will make a hissing sound when its cap is opened.

Do not taste the liquid inside the can. Accidental ingestion of fuel can be damaging to your health.

Fuel cans may also be labeled with different colors, according to which fuel they store. Some soldiers use yellow cans and black writing for diesel fuel. Others use red cans and white writing for MOGAS. Remember to get your CO's approval before painting and stenciling your can.

—Ms. Carey Mitchell, Petroleum and Water Business Area, US Army TACOM-TARDEC, AMSTA-TR-D/210, Warren, MI 48397-5000, DSN 786-4154 (810-574-4154).

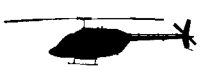
Accident briefs
Information based on *preliminary* reports of aircraft accidents

CH47

Class C
D series

- During Maintenance Test Flight, right side pilot door came off and struck one blade and aft pylon. Aircraft was landed without further incident.
- During landing to a snow-covered ridge, aircraft ramp and cargo hook sustained damage when they contacted a rock.

OH58



Class C
D (I) series

- Aircraft descended into trees while on live-fire range. Post-flight inspection revealed damage to tail rotor blades.
- During aircraft run-up, DC generator caught on fire. Crew used fire extinguishers to attempt to control fire. Installation fire department extinguished remaining fire.

Class C
D (R) series

- During simulated engine failure at altitude, engine torque peaked to 133% for 1 second and was verified by data playback at end of the flight.

UH60

Class A
L series

- Crew experienced brownout conditions on take-off. Aircraft contacted the ground nose low. Several occupants sustained reportable injuries. Aircraft destroyed.

Class C
A series

- Aircraft landed in extremely dusty conditions in rough terrain at patient pick-up point during an urgent MEDEVAC mission. The on-board medic reported a loud thumping noise. Mission transporting patient was continued. Aircraft was refueled prior to terminating mission. Post-flight inspection confirmed damage to undercarriage at three locations, and separation of the searchlight.

Class C
L series

During landing to a dusty LZ without illumination, main rotor blades contacted trees at approximately 30 ft AGL; aircraft was landed without further incident.

Class D
A series

- ALQ144 cover was in oil cooler compartment when aircraft was started. Cover wrapped around driveshaft and struck other aircraft components within the compartment. Both fuel lines were pulled from their breakaway valves, causing fuel starvation of both engines. Fuel lines, main fuel crossfeed breakaway valves and oil cooler line were replaced.
- During pre-flight, the crew found both cables for the AN/ALQ-144 had come loose from their static mounts and wrapped around the No.2 tail rotor drive shaft, causing damage.

For more information on selected accident briefs, call DSN 558-9855 (334-255-9855). Note: Information published in this section is based on *preliminary* mishap reports submitted by units and is subject to change.

Aviation messages

Most recent safety messages issued by AMCOM

Aviation safety-action messages

December 99

AH-64-00-ASAM-03: M/R Rotor Drive Plate Bolts/Holes
AH-64-00-ASAM-04: BUCS Update
AH-64-00-ASAM-05: Inspect BUCS Servocylinders
UH-60-00-ASAM-03: Primary Servo Assemblies

January 00

AH-1-00-ASAM-04: Inspection of Anti-Drive Bellcrank
AH-64-00-ASAM-06: Inspect BUCS Servocylinders
AH-64-00-ASAM-07: Inspect No.2 Generator Power Cables
AH-64-00-ASAM-08: Inspect Fire Extinguisher Tubes for Corrosion
AH-64-00-ASAM-09: Tail Rotor Hanger Bearing
OH-58-00-ASAM-01: Oil Cooler Support/Oil Cooler Fan

February 00

AH-1-00-ASAM-05: Inspect for Relay – Solid State
AH-1-00-ASAM-06: Tail Rotor Yoke Assembly
UH-60-00-ASAM-04: Inspect Tail Landing Gear/ Shock Strut

General

00-GEN-01: Night Vision Goggles

Safety-of-flight messages

December 99

AH-1-00-03: Interim Retirement Life-Impeller
AH-1-00-04: Life Limit – Critical Rotating components
UH-1-00-02: Interim Retirement Life - Impeller
UH-1-00-03: Life Limit – Critical Rotating Components

January 00

AH-1-00-05: Life Limit – Critical Rotating Components
CH-47-00-04 Engine Transmissions Records
UH-1-00-04: Life Limit – Critical Rotating Components

February 00

AH-1-00-06: T53 Turbine Wheel Components
AH-64-00-05: Inspect M/R Blade attach pin
AH-64-00-06: Inspect Vertical Stabilizer Hardware
UH-1-00-05: Inspect Tail Boom Vertical Fin Spar Assembly
UH-1-00-06: T53 Turbine Wheel Components

Don't have one of these? Log onto the Risk Management Information System (http://rmis.army.mil). Your ASO or commander should have a password.

Learn from the mistakes of others; you won't live long enough to make them all yourself--

—Aviation Safety Vortex.

IN THIS ISSUE

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POV Fatalities through 29 Feb

FY00	FY99	3-yr Avg
41	53	44

U.S. ARMY SAFETY CENTER

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